



Environmental Consultants, Inc.

EXHIBIT 2

SITE HEALTH AND SAFETY PLAN

**TRENTON RIVERFRONT PROPERTY
16.75 Acre Parcel, West Jefferson Avenue
Trenton, Michigan**

prepared for

**DOWNRIVER AREA
BROWNFIELD CONSORTIUM
Michigan, U.S. EPA Region 5**

AKT Project Number: 1600.20-01

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prepared by

AKT ENVIRONMENTAL CONSULTANTS, INC.

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1.0 INTRODUCTION

This document provides site-specific health and safety controls to be used by all AKT Environmental Consultant, Inc., (AKT) employees and subcontractors during field activities conducted for the Downriver Area Brownfield Consortium (DABC) at the Trenton Riverfront Property (subject property). The subject property is located on West Jefferson Avenue, Trenton, Wayne County, Michigan (Figure 1).

1.1 SCOPE AND PURPOSE

This Health and Safety Plan (HASP) has been prepared to provide all AKT employees and subcontractors with protocols conducive with a safe working environment during field activities planned for the subject property. The site tasks that will be conducted during the Phase II subsurface investigation at the subject property will include one or all of the following: 1) surveying, 2) aquifer characteristics testing, 3) concrete coring, 4) Geoprobe/ Hollow-stem auger soil borings, 5) monitoring well drilling and installation, 6) equipment decontamination, and 8) investigation derived waste collection and on-site storage. The HASP was developed to reduce the potential for personal injury, illness, and physical damage to equipment and property by stressing management responsibilities, medical surveillance, training, periodic work site evaluations and audits, accident prevention and investigation record keeping, personal protective equipment (PPE), hazard assessment criteria, site controls, decontamination procedures, and general safety requirements.

This HASP has been prepared in accordance with the requirements of the following:

- 29 Code of Federal Regulations (CFR) 1910.120: *Safety and Health Regulations for General Industry*, Occupational Safety and Health Administration (OSHA), as amended December 1986.
- *Standard Operating Safety Guides*, U.S. Environmental Protection Agency (EPA), 1992.
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, National Institute of Occupational Safety and Health Administration (NIOSH), Publication No. 85-115, October 1985.

All AKT and subcontractor personnel performing field activities related to investigations at the subject property will be provided a copy of this HASP and will be required to follow its protocols. All operations, procedures, and equipment at the subject property will meet the applicable requirements of OSHA 1910 and 1926. All site workers will be required to acknowledge their understanding of this document by signing the Personal Acknowledgment Signature Form, which is provided in Appendix A. **AKT claims no responsibility for use of this HASP by others.** This HASP is written for the specific site conditions, purposes, dates, and personnel specified and may be amended if conditions change.

The requirements of this plan are mandatory for all AKT personnel, AKT subcontractors, and visitors to areas controlled by AKT. **Nothing in this plan relieves subcontractors of the responsibility to provide a safe workplace for their employees.** Each subcontractor must review this plan and verify that its hazard controls are sufficient for their specific site

activities. If not sufficient, the subcontractor is responsible to supplement these controls to provide adequate protection.

1.2 HEALTH AND SAFETY PERSONNEL

The investigation at the subject property will be conducted by AKT. Subcontractors will be utilized to provide Geoprobe borings and laboratory analysis. The organization and functions of personnel within AKT are described in the following subsections. A contact list for key project personnel is provided in Table 1 (Refer to Appendix B for a list of Emergency contact numbers).

1.2.1 AKT Project Director

The AKT Project Director is responsible for executing all contractual obligations. This individual will ensure that AKT's full resources are accessible to the AKT Project Manager and that all staffing and administrative support needs of the project are met in a timely manner. The Project Director will play an active role in client interaction and will review all deliverables. The AKT Project Director is Mr. Tony Anthony, CPG, CHMM.

1.2.2 AKT Project Manager

The AKT Project Manager will ensure safe execution of the project by performing the following actions. This individual will be responsible for designating a qualified individual to serve as the Site Health and Safety Officer (SHSO) during the subject property investigation field activities. This individual also will ensure that the project has sufficient resources to operate safely. The AKT Project Manager also will approve this HASP before any field activities begin, after ensuring that a qualified individual has reviewed it. In this context, a "qualified individual" is a person that has: 1) at least 2 years of experience in the development and implementation of occupational safety and health programs or implementation of health and safety plans; 2) 40-hour initial and 8-hour supervisor training; and 3) a Bachelors degree or higher in industrial hygiene, hazardous materials control, or other science-related discipline. The AKT Project Manager is Mr. John Havrilla, CHMM.

1.2.3 AKT Health and Safety Manager

The AKT Health and Safety Manager (HSM) will review and internally approve this HASP. In consultation with the AKT Project Director and AKT Project Manager, this individual will ensure that an adequate level of personal protection exists for the potential site hazards for all field personnel. The HSM does not report to either the AKT Project Director or AKT Project Manager on health and safety matters; therefore, this individual's actions are not dictated by any program or project constraints (such as budget and schedule) other than the assurance of appropriate safeguards for staff conducting the investigation activities. The AKT Health and Safety Manager is Mr. Eric Ehlers.

1.2.4 Site Health and Safety Officer

The Site Health and Safety Officer (SHSO) is responsible for implementing the provisions of this HASP and ensuring that all health and safety requirements are enforced at the subject property. Prior to the initiation of field activities, the SHSO will conduct a field staff orientation and briefing to acquaint project personnel with the potential hazards and associated safety controls of the subject property. The SHSO may deviate from provisions in the HASP if extraordinary field conditions arise. The AKT Project Manager and HSM will select the individual representing AKT as the

SHSO prior to field activities. The SHSO also is responsible for the following health and safety controls and procedures:

- Implementation of this HASP.
- Stopping project activities and/or evacuating the site if unanticipated hazardous conditions are encountered for which project personnel are unprepared to respond or if any operation threatens employee or public health or safety.
- Conducting routine inspections to verify compliance with this HASP and notifying the HSM of violations or deviations from the HASP, or unexpected hazardous conditions.
- Conducting a daily safety meeting and tailgate briefing
- Ensuring that employees have access to this HASP at all times.
- Maintaining site safety records.
- Coordinating emergency medical care.
- Verifying that personal protective equipment (PPE) are properly used and maintained.
- Controlling entry and access to work sites.
- Verifying that personnel (AKT employees and visitors) allowed access inside the Exclusion Zone or other controlled areas have completed the required training (i.e., 40-hour training, 8-hour refresher, and site briefing).

1.3 TRAINING

All AKT employees, managers, supervisors, consultants and subcontractors who conduct field activities at the subject property must have completed the initial site-specific safety training, initial 40-hour Hazardous Waste Operations training course (OSHA 29 CFR 1910.120), and annual 8-hour refresher training within the past 12 months. Managers and supervisors directly responsible for site activities should complete an 8-hour Supervisor Training course in addition to the 40-hour training course and 8-hour refresher course. In addition, all entrants and attendants must have received confined space entry training prior to confined space entry activities. Field personnel and site visitors without the required training will not be permitted in the Exclusion Zone(s).

A safety meeting (“tailgate briefing”) conducted by the SHSO, will be held on-site prior to each day’s activities to reiterate the health and safety requirements or to inform site personnel of upcoming operations and safety requirements. A person who is certified in first aid and CPR should be on-site with field personnel at all times.

1.4 MEDICAL SURVEILLANCE

AKT employees who participate in field activities involving known or suspected hazardous materials, are monitored through AKT’s annual medical surveillance program. Personnel performing site work have received a medical baseline or follow-up examination within the past 12 months. A physician’s statement declaring that all AKT field personnel are medically qualified to perform hazardous waste related activities, will be kept on file in the AKT Farmington Hills, Michigan office.

Subcontractor employees must participate in their employer’s medical monitoring program. Field personnel who have not received medical clearance will not be permitted into the Exclusion Zone(s).

Table 1. Contact List for Investigation

<i>U.S. EPA Region 5</i>		
Mr. Mike Gifford, EPA Project Manager		
(312) 886-7257		
<i>AKT Environmental Consultants, Inc. (AKT)</i>		
Tony Anthony	Cellular (248) 210-5002	Detroit Office (313) 961-5400
		Farmington Hills Office (248) 615-1333
John Havrilla	Cellular (248) 210-5010	Detroit Office (313) 961-5400
		Farmington Hills Office (248) 615-1333
Eric Ehlers	Cellular (248) 210-5005	Detroit Office (313) 961-5400
		Farmington Hills Office (248) 615-1333

2.0 SITE CHARACTERIZATION AND ANALYSIS

2.1 SUBJECT PROPERTY INFORMATION

The DABC retained AKT Environmental Consultants, Inc. (AKT), to conduct a Limited Subsurface Investigation at the subject property located on West Jefferson Avenue, Trenton, Michigan (Figure 1). The subject property, located on the east side of West Jefferson Avenue in Trenton, Michigan, consists of approximately 16.75 acres and is situated in the northeast quarter (NE 1/4) of Section 18, Township 4 South (T. 4S.), Range 11 East (R. 11E.), Wayne County, Michigan.

Previous environmental reports pertaining to the subject property were obtained from the Michigan Department of Environmental Quality (MDEQ). Each of these reports is summarized in the Work Plan/SAP (Exhibit 1 of the QAPP).

The purpose of AKT's subsurface investigation is to evaluate recognized subsurface environmental conditions associated with the subject property. The investigation is not being performed in response to a specific release, but rather as part of a brownfield redevelopment action to ready the property for redevelopment.

A summary of the soil and groundwater sampling plan is summarized in Table 1 of the Work Plan/SAP (Exhibit 1). Additionally, Table 1 of Exhibit 1 presents the identified recognized environmental conditions, sample requirements, and analytical requirements associated with the subject property. The proposed sample locations are depicted on figures presented in the Work Plan/SAP (Exhibit 1).

2.2 HAZARDOUS SUBSTANCE CHARACTERIZATION

Chemical hazards of primary concern anticipated during the investigation field activities (based on past subject property use and available analytical data) at the subject property include:

- Inhalation of vapors or dusts containing organic compounds, PCBs, pesticides, or metals.
- Oral ingestion of organic compounds, PCBs, pesticides, or metals.
- Dermal contact to organic compounds, PCBs, pesticides, or metals.

Controls for these hazards will be available in the vehicle or field office, where fire extinguishers, first-aid kits, and PPE will be kept. Table 2 presents the occupational exposure guidelines for typical chemicals of concern.

The primary anticipated physical hazards for the subject property include:

- Use of potentially hazardous drilling equipment
- Extreme weather conditions
- Working around utility lines, poles, or wires
- Working within structurally damaged buildings
- Slips, trips, and falls
- Heat stress associated with the use of impermeable clothing and/or high ambient temperatures
- Cold stress during the winter season
- Confined

Table 2. Occupational Exposure Guidelines for Substances Potentially Associated with the Subject Property

SUBSTANCE	EXPOSURE LIMITS	SYMPTOMS/WARNING PROPERTIES
Lead (Pb)	(OSHA) PEL = 100 ppm (0.05 mg/m ³) (NIOSH) = 0.100 mg/m ³ Air concentration to be maintained so that worker blood lead remains <0.060 mg/100 g of whole blood IDLH = 700 mg/m ³	Poisonous if swallowed, inhalation of dust poisonous. Fire may produce irritating or poisonous gases.
PCBs (Aroclor 1242)	(OSHA) 1mg/m ³ [Skin] IDLH = [10mg/m ³] Carcinogen	Occupational carcinogen; irritation of eyes and liver damage

SUBSTANCE	EXPOSURE LIMITS	SYMPTOMS/WARNING PROPERTIES
PCBs (Arcolor 1254)	(OSHA) 0.5mg/m ³ [skin] IDLH = [5mg/m ³ carcinogen	Occupational carcinogen; irritation of eyes; acne-form dermatitis, and liver damage.
Trichloroethylene	NIOSH = 25 ppm IDLH = 1000 ppm PEL = 100 ppm	Poisonous if swallowed Vertigo headache if inhaled Visual distortion
Benzene	(OSHA) PEL = 1 ppm STEL = 5 ppm (see personal protection level) IDLH = 3,000 ppm	May be poisonous if inhaled or absorbed through skin. Vapors may cause dizziness or suffocation. Contact may irritate or burn skin and eyes.
Ethylbenzene	(OSHA) PRL = 100 ppm STEL = 125 ppm IDLH = 2000 ppm (see personal protection level)	Contact may cause irritation or burn skin and eyes, may be poisonous if absorbed through skin. Vapors may cause dizziness or suffocation.
Toluene	(OSHA/NIOSH) PEL = 100 ppm STEL = 150 ppm IDLH = 2000 ppm 10 Hr. TWA 200 ppm 10 min. ceil 0 ppm at breathing zone without respiratory protection (see personal protection level)	May be poisonous if inhaled or absorbed through skin. Vapors may cause dizziness or suffocation. Contact may irritate or burn skin and eyes.
Xylene	(OSHA) PEL = 10 ppm (435 mg/m ³) (NIOSH) 100 ppm 10 Hr. TWA 200 ppm 10 min. ceil 0 ppm at breathing zone without respiratory protection (see personal protection level)	May be poisonous if inhaled or absorbed through skin. Vapors may cause dizziness or suffocation. Contact may burn skin and eyes.
Cadmium (Cd)	(OSHA) PEL = 0.2 mg/m ³ for dust and = 0.1 mg/m ³ for fume (NIOSH) Carcinogen IDLH = Carcinogen (50 mg/m ³ for dust) (9 mg/m ³ for fumes)	Inhalation and ingestion may cause pulmonary and edema, dyspnea, cough, chest tight, substernal pain, headache, chills, muscle aches, nausea, vomit, diarrhea, anosmia, emphysema, proteinuria, mild anemia.
Chromium (Cr)	(OSHA) PEL = 1 mg/m ³ (NIOSH) 0.5 mg/m ³	Inhalation and ingestion may cause histologic fibrosis of lungs.
Napthalene	(OSHA) PEL = 10 ppm STEL = 15 ppm IDLH =- 500 ppm	Eye irritation, headache, confusion, excitement, nausea, profuse sweating, dermatitis are some of the symptoms.

SUBSTANCE	EXPOSURE LIMITS	SYMPTOMS/WARNING PROPERTIES
Other PNAs (See coal or tar pitch) benzo(a)pyrene, Phenanthrene, chrysene, anthracene and pyrene	(OSHA) PEL = 0.2 mg/m ³ IDLH = [700 mg/m ³] carcinogen	Carcinogen, Dermatitis, bronchitis
Cyanide	(OSHA/NIOSH) 5 mg/m ³ (4.7 ppm) [10 min.] IDLH = 50 mg/m ³	Inhalation might cause Asphyxia and possible death; Irritation of eyes and skin, nausea and headaches
Asbestos (dusts)	(NIOSH/OSHA) 0.1 fiber/cc, longer than 5 Um, over 8 hrs.	Carcinogen, respiratory and eye irritant. Inhalation hazard.
Arsenic	(OSHA) 0.01 mg/m ³ NIOSH .002 mg/m ³ Carcinogen IDLH = 100 mg/m ³	Inhalation may cause ulceration of nasal septum
Tetrahydrofuran	(NIOSH/OSHA) 590 mg/m ³ IDLH = 20,000 ppm	Inhalation may cause upper respiratory irritation. Skin/eye contact; nausea, dizziness, and headache.
Mercury (vapor)	(NIOSH/OSHA) 0.05 mg/m ³ (skin) IDLH = 28 mg/m ³	Cough, chest pain, dyspnea
Selenium	(NIOSH/OSHA) 0.2 mg/m ³	Inhalation may cause irritation of eyes, nose and throat; ingestion will cause fever or dyspnea
Zinc (as oxide form)	(NIOSH/OSHA) 5 mg/m ³	Inhalation may cause dry throat, cough or fever
Chloroform	(OSHA) 2 ppm (9.78 mg/m ³) Carcinogen IDLH = 1000 ppm	Inhalation may cause dizziness, mental dullness and nausea; contact may cause irritation of eyes and skin

3.0 SITE CONTROL

3.1 WORK ZONES

The appropriate measures for coordinating road access for drill rigs and other heavy equipment will be determined by the SHSO. The establishment of work zones will be associated primarily with intrusive investigation activities. Work zones will not be necessary for surface soil sample collection, geophysical surveys, land surveying or other limited activities.

Work areas will be divided into three zones. The immediate working area (within 10 feet of sampling mechanism) requiring environmental evaluation will be considered an *Exclusion Zone*,

with surrounding areas (up to 25 feet of sampling mechanism) serving as a *Support Zone*, and an intervening area for decontamination designated as a *Contamination Reduction Zone (CRZ)*. Zones may be altered by the Field Manager dependant upon field conditions (i.e., wind direction, new source identification, etc.).

3.1.1 Exclusion Zone

The intent of the exclusion zone is to isolate the area of field investigation activity and to minimize the spread of contamination to support areas and/or off-site locations. Personnel entering the Exclusion Zone must be wearing the prescribed level of protection (see Section 4.3.1), and be authorized to enter the Exclusion Zone (see Sections 1.3 and 1.4). Personnel, equipment, and/or materials exiting the Exclusion Zone will be considered contaminated; personnel clothing, equipment and materials will be decontaminated or containerized, according to procedures described in Section 6.0 of this HASP.

3.1.2 Contamination Reduction Zone (CRZ)

The CRZ is the area that begins at the “hot line” for the Exclusion Zone and continues to the contamination control line (CCL). The CRZ is a transitional zone between property investigation areas (i.e., soil boring locations) and the Support Zone. When personnel, equipment, or materials cross the “hot line,” they are assumed to be affected by investigation activities. Decontamination procedures minimize the threat of contamination escaping to the Support Zone.

A contamination reduction corridor (CRC), which includes brushes, detergents, containers, and water necessary for full personnel and portable equipment decontamination, will be located within the CRZ, *if necessary*. A separate control facility will be established for heavy equipment decontamination needs, if required. In addition, safety equipment (e.g. emergency eyewash, fire extinguisher, and first-aid kit) will be staged in this zone, typically within the AKT field vehicle or site trailer (if available). The CRC will be located upwind whenever possible.

A CRZ will be used only in cases where high concentrations of contaminated material have collected on personnel and/or equipment. In areas where low contamination is detected, only an exclusion zone will be used.

3.1.3 Support Zone

The Support Zone (i.e., the outermost zone of site investigation activities) is separated from the CRZ (if used) by the CCL and is considered a clean area. Movement of personnel and materials from the Support Zone into the CRZ is generally unrestricted except as required through access points controlled for administrative purposes. However, only uncontaminated/decontaminated personnel or materials may enter this zone from the CRZ. The Support Zone will serve as the communication center and source of emergency assistance to operations occurring in the Exclusion Zone and CRZ (if used). The SHSO or Field Manager will maintain a record of each person entering or visiting the Support Zone. A sign in/out log will track workers and visitors, establish exposure times, and establish a head count in the event of an emergency. A copy of the “Sign In/Out Log” is presented in Appendix A.

3.2 SITE SECURITY

To enhance security during nonworking hours, the SHSO and/or Field Manager will secure equipment and supplies in locked facilities, and open boreholes will be covered and secured with plywood or similar material.

3.3 SPILL CONTAINMENT PROGRAM

The activities covered in this HASP, with the exception of steam cleaning operations (i.e., decontamination of Geoprobe and heavy equipment), are not expected to generate significant quantities of liquid waste.

A spill containment program will be implemented during all field activities that meets drum and container handling requirements in accordance with 29 CFR 1910.120. Hazardous substances and high level contaminated soils, liquids, and other residues also will be handled, transported, labeled, and disposed of in accordance with 29 CFR 1910.120. If a major spill occurs, AKT will contact the local Fire Department [911] immediately, and if possible, will implement controls to contain and isolate the spilled substance.

4.0 WORK PRACTICES AND PERSONAL PROTECTIVE EQUIPMENT

4.1 WORK PRACTICES

Field workers will adhere to the established safe work practices for their respective specialties (e.g., drilling, coring). The need to exercise caution in the performance of specific work tasks is made more acute due to weather conditions, restricted mobility, and reduced peripheral vision caused by the protective gear itself/ the need to maintain the integrity of the protective gear; and the increased difficulty in communicating caused by air purifying respirators (APRs). Field work at the areas requiring environmental evaluation will be conducted considering the safety and health of those involved. Important principles for working at the subject property include the following:

- In any unknown situation, always assume the worst conditions and plan responses accordingly.
- Employ the buddy system during all field activities conducted within an Exclusion Zone or areas where injured personnel would not be noticed and aided by field personnel at the Subject property. Under no conditions will any person be permitted to enter an Exclusion Zone alone. Communication between personnel will be established and maintained at all times and will include the use of hand signals during APR deployment (if needed). See Appendix B for a list of Hand Signals.
- Smoking, eating or drinking will not be permitted in the Exclusion Zone or CRZ.
- Work breaks will be scheduled to prevent heat stress-related accidents, fatigue, or illnesses.
- If Level C protection is required at the subject property, facial hair must be removed to allow for proper respirator fit.
- Be aware that chemical constituents may mimic and/or enhance symptoms of other illnesses or intoxication.

- Be observant of not only one's own immediate surroundings, but also those of others. All field personnel will be working under constraints, therefore, a team effort is needed to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment and while using PPE because of vision, hearing and communication may be restricted.
- The SHSO or Field Manager will maintain Daily Activity Reports, recording daily activities, meetings, incidents, and data relating to the project. These logs will remain on-site during the full duration of the project so that other personnel may add information in the same record book.

4.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protection requirements for all personnel conducting investigative field activities will be initiated at U.S. EPA Level D with a provision for upgrade to Level C, as necessary. Specific components for any level of protection will be selected based on hazardous assessment, with additional elements added, as necessary. Table 3, provides PPE selection health action levels.

Table 3. PPE Health Action Levels

Environmental Monitoring - The following environmental monitoring instruments can be used on the subject property.	
PID	
Air Monitoring: Air monitoring will be conducted during the sampling procedures to monitor exposure levels from airborne lead and asbestos. All personal air monitoring instruments will be calibrated and maintained per manufacturer's specifications. Test samples should be obtained for initial air monitoring to predict the type of PPE required.	
Personnel Monitoring: Personal exposure sampling will be implemented when deemed necessary by a Toxicologist, Industrial Hygienist, or other properly qualified individual.	
Heat/Cold Stress Monitoring: The expected air temperature will be <u>55-75 °F</u> . If temperatures exceed 80 °F, set up shaded rest area. If temperatures are below 32 °F, set up heated rest area.	
Personal Protective Equipment	
<u>Health Action Levels</u>	<u>Required PPE Level</u>
PID Deflections 0-5 ppm in the breathing zone	Level D
PID Deflections of >5 ppm <10 ppm sustained for more than 5 minutes in the breathing zone	Level C
PID Deflections >10 ppm <50 ppm sustained for more than 15 minutes in the breathing zone	Level B
PID Deflections >50 ppm in the breathing zone	Shut down operations & contact AKT HSO
Test sample concentration for lead is <50 $\mu\text{g}/\text{m}^3$ for 8 hr. TWA and asbestos is <0.2 f/cc	Level D
Test sample concentration for lead in a >50 $\mu\text{g}/\text{m}^3$ for 8 hr. TWA and is >0.2 f/cc for asbestos	Level C

U.S. EPA Level D Protection

- Tyvek7 coveralls*
- Safety boots
- Safety glasses with side shields or chemical splash goggles
- Gloves (surgical gloves: mandatory when handling potentially contaminated materials or contaminated tools)
- Disposable boot covers*
- Hard hat* (mandatory during drilling activities)

* Optional, as applicable

U.S. EPA Level C Protection

- Full-face piece APR with appropriate cartridges (National Institute of Occupational Safety and Health [NIOSH]-approved)
- Chemical-resistant clothing (e.g., coveralls with long-sleeved jacket; one- or two- piece chemical splash suit; disposable chemical-resistant one-piece suit [Tyvek])
- Inner and outer chemical-resistant gloves
- Chemical-resistant safety boots
- Two-way radio communications
- Disposable boot covers*
- Hard hat* (mandatory during drilling activities)
- Escape pack*
- Face shield*

* Optional, as applicable

4.3 OTHER PROTECTIVE EQUIPMENT

Hearing protection in the form of earplugs will be worn at all times by workers when within 25 feet of operating drilling rig or excavation equipment. On-site personnel working in areas where there is possible danger of head injury from impact or from falling or flying objects will be protected by hard hats meeting the requirements and specifications of American National Standards Institute (ANSI) Z89.1-1986. Safety footwear will have steel toes and meet the requirements of ANSI Z41 PT 91 M I/75 C/75.

4.4 RESPIRATOR SELECTION AND FIT TEST

All personnel who may wear respiratory protection on this project will have current medical clearance for respirator use and a current fit test. Certified Industrial Hygienist (CIH) or other qualified person will perform quantitative fit testing. This information will be retained in the AKT office in Farmington Hills, Michigan.

5.0 SITE MONITORING

Monitoring of the work environment will ensure that immediately dangerous to life or health (IDLH) or other dangerous conditions are identified. At a minimum, this monitoring will include evaluations for combustible atmospheres, oxygen deficient environments, and hazardous concentrations of airborne constituents.

Daily air monitoring information will be maintained in the SHSO's field logbook(s) and/or Daily Field Reports, a copy of which is presented in the work plan. These logs will contain the names of all personnel conducting work at the subject property, describe the work being performed at the subject property, and describe any new procedures established for performing work. In addition, these logs will list the types of air monitoring equipment being used, how and when this equipment was calibrated, air monitoring results, the level of PPE being used, and complete descriptions of all injuries, accidents, physical complaints, and unusual occurrences.

5.1 AIR MONITORING

If possible, the SHSO will evaluate the presence of airborne chemicals of concern through use of direct reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being employed at each area requiring environmental evaluation, and may be used as a basis for upgrading or downgrading the levels of protection, at the discretion of the SHSO. Required levels of PPE are summarized in Table 3. Monitoring for combustible atmospheres and oxygen-deficient environments will be conducted during all field activities, including, but not limited to, soil boring, monitoring well installation, concrete coring, and equipment decontamination using the PID.

6.0 DECONTAMINATION

6.1 PERSONNEL DECONTAMINATION

Table 4 provides instruction for decontaminating of personnel exiting the subject property in which U.S. EPA Level C PPE was used. For areas where lesser levels of PPE are appropriate, this table will be used as a guideline, but the process will be modified to Level D decontamination. Level D decontamination involves removing any disposable protective clothing and washing face and hands before eating or drinking.

Disposable items (e.g. Tyvek coveralls, inner gloves, and latex overboots) will be changed daily unless there is reason for changing sooner. Dual respirator cartridges will be changed daily unless more frequent changes are deemed appropriate by site surveillance data or personal assessment. Pressurized sprayers or other designated equipment will be available in the decontamination area for wash down and cleaning of personnel, samples, and equipment.

Respirators will be decontaminated after daily use. The masks taken from the drop area will be disassembled, the cartridges set aside, and other parts placed in a cleansing solution. After an appropriate time in the solution, the parts will be removed and rinsed off with tap water. The old cartridges will be discarded into the container for contaminated trash disposal. Each morning, masks will be reassembled and new cartridges installed. Personnel will thoroughly inspect their own respirators prior to each time the respirators are donned. Where atmosphere-supplying respirators are used, specific, trained personnel will be assigned to maintain and monitor the atmosphere supply system in strict accordance with the manufacturer's instructions and the protocols established for that specific area.

Table 4. Decontamination Process

Segregated Equipment Drop	1. Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) On plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Boot Cover and Glove Wash	2. Scrub outer boot covers and gloves with decon solution or detergent and water.
Boot Cover and Glove Rinse	3. Rinse off decon solution from boot cover and glove wash using copious amount of water.
Tape Removal	4. Remove tape around boots and gloves and deposit in plastic liner.
Boot Cover Removal	5. Remove boot covers and deposit in plastic liner.
Outer Glove Removal	6. Remove outer gloves and deposit in plastic liner.
Tyvek Suit Removal	7. Remove Tyvek suit and deposit in plastic liner.
Face Piece Removal	8. If respirators are used, wipe down the respirator exterior with a wet paper towel, remove and deposit in container with plastic liner. Avoid touching face with fingers. Respirators will be washed in a sanitizing solution, rinsed with potable water and allowed to dry.
Inner Glove Removal	9. Remove inner glove and deposit in lined container. 10. Wash hands, face, and any other potentially contaminated areas with a potable water/mild soap solution followed by a potable water rinse. 11. Shower and launder personal clothing as soon as possible upon completing daily activities.

6.2 SMALL EQUIPMENT DECONTAMINATION

Small equipment will be protected as much as possible from contamination by draping, masking, or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. Contaminated equipment will be taken from the drop area and the protective coverings removed and disposed of in the appropriate containers. Sample equipment will be

decontaminated by removing gross contamination in the Exclusion Zone and then taken to a central decontamination area. Decontamination of small equipment will be conducted in the method described in Table 5. Any dirt or obvious contamination will be brushed or wiped with disposable paper wipe. The units will then be taken indoors and placed in a clean tub, wiped off with damp disposable wipes and dried. The units will be checked, standardized and recharged as necessary for the next day's operation. The units will then be prepared with new protective coverings.

Table 5. Small Equipment Decontamination

Soil Sampling Equipment -

Detergent and distilled water wash, distilled water rinse between each sample collection with fresh water. Dispose of nitrile gloves in trash bag.

Sludge/Water Sampling Equipment -

Disposable equipment to be containerized and disposed of properly. Non disposable equipment to be detergent and distilled water wash, distilled water rinse between each sample collection with fresh water. Nitrile gloves, disposable.

All equipment and solvents used for decontamination shall be decontaminated or disposed of properly. All site personnel should minimize contact with contaminants in order to minimize the need for extensive decontamination.

6.3 HEAVY EQUIPMENT DECONTAMINATION

It is anticipated that the down hole equipment of the drilling rigs and/or Geoprobe will be contaminated during borehole activities. Drilling rigs, Geoprobe, or other heavy equipment machinery will be cleaned at the work area or central staging area with high-pressure steam. Loose material will be removed by brush. The person performing this activity will be at least at the level of protection utilized during the personnel and monitoring equipment decontamination.

6.4 DISPOSAL OF DECONTAMINATION EQUIPMENT

Disposable PPE, bailers, and other disposable materials will be staged on-site for disposal. Once used, disposable materials (e.g., gloves and Tyvek) will be double-bagged and stored as is or placed in U.S. Department of Transportation (DOT) approved 55-gallon drums. Double bagged PPE will not be stored outdoors. Water used in the decontamination of equipment will not be collected or containerized, unless gross contamination is identified. Additionally, soils will not be collected or containerized, unless gross contamination is identified.

7.0 EMERGENCY PLAN

This section identifies the emergency contingency plan undertaken for field activities at the subject property. Other sections of this HASP also provide information that would be used under emergency conditions. Appendix B provides emergency telephone numbers, route map to emergency medical facility(s), and emergency signals.

7.1 PERSONNEL ROLES, LINES OF AUTHORITY AND COMMUNICATION

The investigation Field Manager is the primary authority for directing operations during the field activities at the Subject property under emergency conditions until other personnel (Local

Emergency Personnel) can take control of the situation. All communications during emergency conditions will be directed through the Field Manager or his/her designee (e.g., the SHSO).

7.2 EVACUATION

Withdrawal Upwind - Field personnel will continually note general wind directions while on-site. A simple windsock or flag may be set up near the work site for visual determinations. Upon noting the conditions warranting movement away from the work site, the crew will move upwind a distance of approximately 100 feet or farther, as indicated by air monitoring instruments. When access to an area is restricted and escape thus may be hindered, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

7.3 EMERGENCY MEDICAL TREATMENT & FIRST-AID

Emergency first-aid supplies will be maintained at the subject property, including first aid kits, emergency eyewash kits and fire extinguishers. The locations of these supplies will be in the AKT support truck and/or site trailer.

Generally, all AKT employees are trained in first aid and cardiopulmonary resuscitation (CPR). Any person injured on-site will be rendered first-aid and/or CPR as appropriate and will be transported the nearest accessible medical facility (see Section 7.4.) To be evaluated by medical personnel for further examination and/or treatment. The transport will be through professional emergency transportation (refer to Appendix B). Under no circumstances will the injured person transport him/herself to a medical facility for emergency treatment.

In the event that an injury occurs in the Exclusion Zone, provisions for decontamination of the victim(s) will be made. However, life-threatening conditions may preclude normal decontamination procedures. As such, arrangements will be made with the medical facility and transporter so that both are aware of the situation and can make appropriate provisions.

Note: All incidents will be reported to AKT. Furthermore, any exposure of AKT personnel to blood borne pathogens, including any exposure that may occur in the rendering of first-aid and/or CPR, will be immediately reported to the Project HSO and Health and Safety Manager.

7.4 MEDICAL ASSISTANCE

The primary source of medical assistance for the Subject property will be Riverside Hospital in Trenton, Michigan. A list of emergency telephone numbers for the subject property is presented in Appendix B, along with a route map and directions to the identified hospital. The address and telephone number for the identified hospital is:

Riverside Hospital
4150 Truax
Trenton, Michigan
(734) 676-4200 (general information)

See Appendix B of this HASP for additional details.

Hospital directions are as follows:

Travel south on West Jefferson approximately 0.3 miles to Truax Avenue. Turn right (east) on Truax and travel approximately .03. The hospital is located on the left side (north) of Truax.

8.0 ACCIDENT/INCIDENT REPORTING

OSHA requires the reporting of work-related incidents resulting in the death(s) of any employee(s) or the hospitalization of three or more employees. The standard also requires the employer to verbally report such incidents to the U.S. Department of Labor within 8 hours after the employer learns of the incident by either written or verbal communication.

If an accident/incident occurs at the subject property, AKT will follow all required OSHA/MIOSHA reporting requirements.

9.0 OTHER HAZARD CONTROL MEASURES

9.1 ILLUMINATION

Site operations will not be permitted without adequate lighting. Therefore, unless provisions are made for artificial light meeting the 5-foot candle requirement of 29 CFR 1910.120, Exclusion Zone operations must halt in time to permit personnel and equipment to exit the Exclusion Zone and proceed through decontamination during adequate daylight. Conversely, operations will not be permitted to begin until adequate lighting is present.

9.2 LABORATORY HANDLING OF SAMPLES

A potential hazard exists to personnel at the laboratory, who analyze the samples collected during the subject property investigation. The laboratory will be notified regarding the nature of the possible hazardous substances involved.

9.3 UTILITIES

Subsurface activities will NOT take place at the subject property without a utility clearance from MISS-DIG. Please allow 72 business hours for MISS DIG to perform staking operations. (Complete Table 6 prior to field activities.)

Table 6. MISS DIG Staking

MISS-DIG Phone Number is (800) 482-7171.

MISS DIG STAKING NUMBER : _____ **Date:** _____

MISS DIG clearance can not be given for subsurface activities that occur on privately owned property. Therefore, any subsurface activities on private property must be cleared through property owner/representative, U.S. EPA or DABC.

9.4 DRILL RIG OPERATIONS

Potential hazards include inhalation exposure to organic vapors, PCBs, and metals, skin contact with contaminants and heat/cold stress. Hazards generally associated with heavy machinery also will be present while drilling. The site will be monitored for organic vapors and gases to allow early detection of exposure hazards. Above and below ground utility lines may pose a safety hazard to workers during excavation or drilling. The driller will maintain a safe clearance distance between overhead utility lines and the drill mast at all times. The location of underground utilities will be determined before excavation or drilling begins. No drilling will take place before MISS DIG indicates that all utilities have been identified.

9.5 BIOLOGICAL HAZARDS

The following biological hazards may be encountered at the subject property: insects, snakes, rodents and poisonous plants (e.g., poison ivy). Field personnel will check with the SHSO and Field Manager to ensure that the use of insect repellent will not interfere with sample collection procedures.

To minimize the threat of bites and insect hazards, all personnel walking through brush will be aware of the potential for encountering insects and snakes and will avoid actions that may increase the possibility of encounters (e.g., turning over sticks, branches, and rocks). Additional caution will be exercised around rockpiles, which are known to support snakes. If a bite occurs, the hospital will be notified that a snake bite victim is inbound. The victim will be transported to the nearest hospital within 30 minutes. First aid consists of applying a constriction band and washing the area around the wound to remove any unabsorbed venom. Cutting and sucking should be omitted (unless medical care cannot be obtained within 30 minutes).

9.5.1 Poisonous Vegetation

All personnel will be familiar with and be able to recognize poison ivy, poison oak and poison sumac in the field. A reaction to poison ivy can be prevented if the exposed skin is washed with mild soap and water within 10 minutes of contact. Contact can be prevented by site workers wearing appropriate clothing. Site workers will remove contaminated clothing and wash their hands and faces before entering the break area.

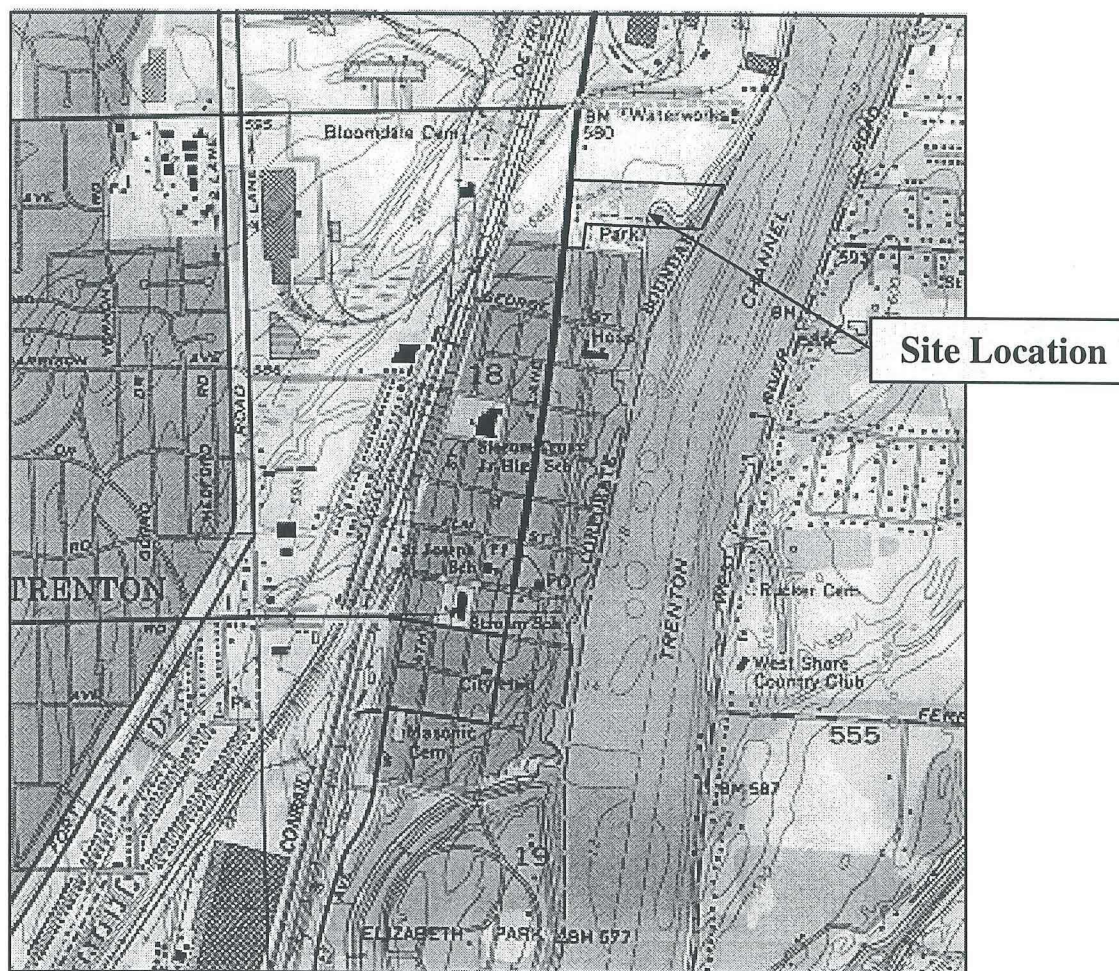
9.5.2 Biting or Stinging Insects

Nests and hives for ants, bees, wasps, hornets and yellow jackets often occur in ground, trees and brush. The area will be checked for obvious nests and hives before it is cleared. If a nest or hive is found, an alternate sampling location will be selected. Bites and stings can be painful and may elicit an allergic reaction. Medical surveillance should identify any individuals with life-threatening allergies. These individuals will not work in areas where there is a great potential for insect stings. If simple first-aid measures do not alleviate the symptoms, the victim will be taken to the nearest medical center.

9.6 HEAT/COLD STRESS

Heat and cold stress will be continuously monitored by field personnel. Heat and cold stress indication symptoms and initial first aid treatment protocols are presented in Appendix C.

FIGURES



Source: USGS 7.5 Minute
Wyandotte, Michigan Quadrangle

Scale 0 2000 4000
Feet

Figure 1.

Topographic Site Location Map
Trenton Riverfront Property
Trenton, Michigan
Wayne County
AKT Project No. 1600.20-01

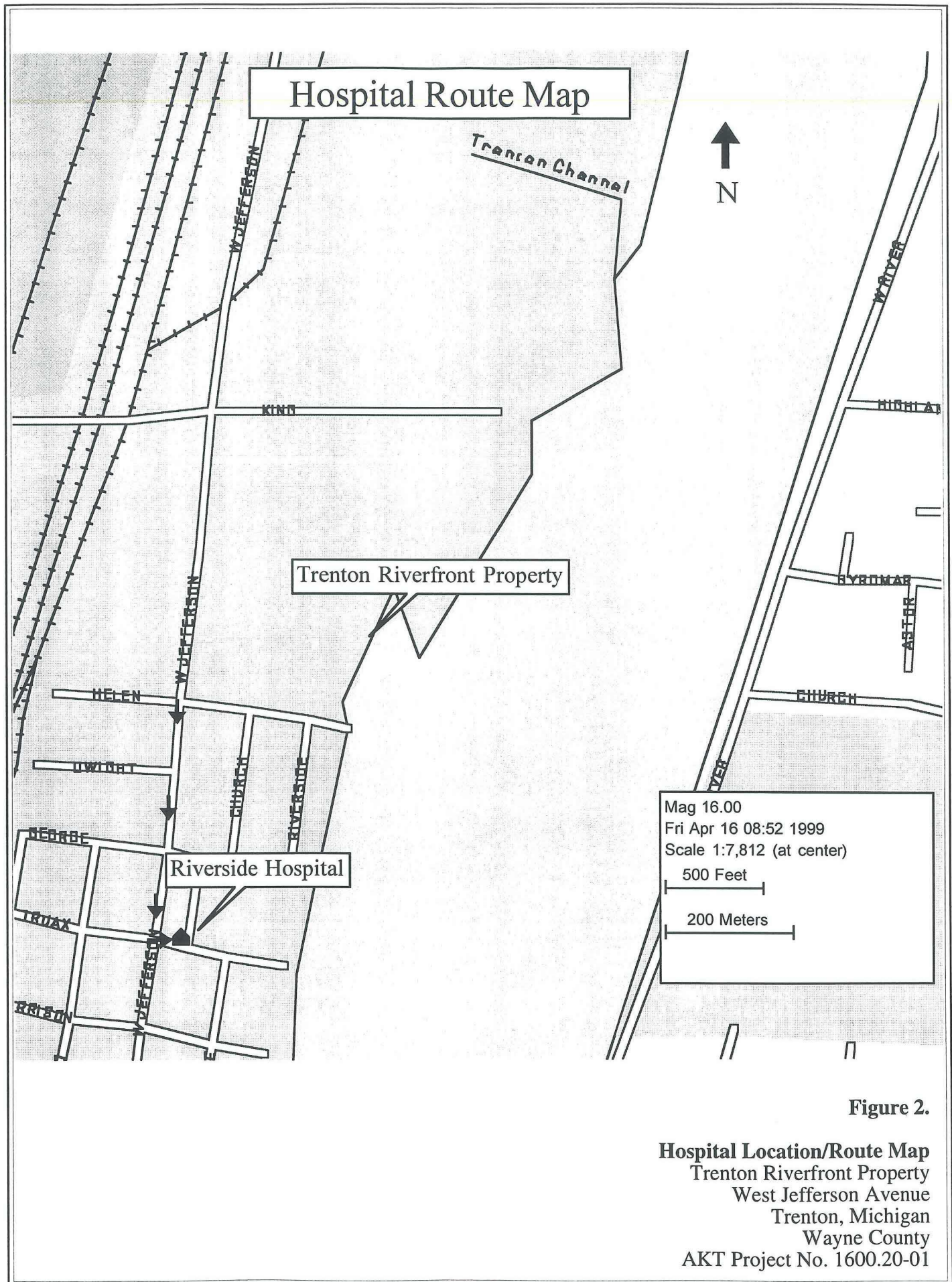


Figure 2.

Hospital Location/Route Map
Trenton Riverfront Property
West Jefferson Avenue
Trenton, Michigan
Wayne County
AKT Project No. 1600.20-01

APPENDIX A

Personal Acknowledgment Signature Form

We, the undersigned, have individually read and will follow the health and safety guidelines presented in this site-specific Health and Safety Plan and will follow them while performing on-site work activities at the TRENTON RIVERFRONT PROPERTY located on West Jefferson Avenue in Trenton, Michigan.

[illegible]

**Trenton Riverfront Property
DABC – Michigan
U.S. EPA Region 5
Health and Safety Plan**

Sign In/Out Log

Trenton Riverfront Property - Trenton, Michigan

[illegible]

APPENDIX B

EMERGENCY TELEPHONE NUMBERS

Ambulance: 911

Hospital Emergency Center: (734) 745-3000 (Riverside Hospital)

Poison Control Center: (313) 745-5711

Police: 911

Fire: 911

OTHER EMERGENCY CONTACTS

- | | | | |
|----|---------------|-------------------------------|--|
| 1. | Tony Anthony | (313) 961-5400/Detroit Office | (248) 615-1333/Farmington Hills Office |
| 2. | Tony Kashat | (313) 961-5400/Detroit Office | (248) 615-1333/Farmington Hills Office |
| 3. | John Havrilla | (313) 961-5400/Detroit Office | (248) 615-1333/Farmington Hills Office |
| 4. | Eric Ehlers | (313) 961-5400/Detroit Office | (248) 615-1333/Farmington Hills Office |
| 5. | | | |

OTHER CONTACTS

MISS DIG: 1-800-482-7171

Water:

Electricity:

Gas:

Telephone:

Other:

EMERGENCY EQUIPMENT:

Communication Equipment:

- Mobile telephones located in the field vehicle.

Medical Equipment:

- First aid kits are located in field vehicles
- Eye wash solutions are located in field vehicles

Fire Fighting Equipment:

- Fire extinguishers are located in field vehicles

Communication Resources:		HAND SIGNALS	
Signal		Interpretation	
Hand gripping throat		Out of air, can't breath	
Grip partner's wrist or both hands around waist		Leave area immediately	
Hands on top of head		Need assistance	
Thumbs up		OK, I'm all right, I understand	
Thumbs down		No, negative	
EMERGENCY ROUTES			
Hospital Name: Riverside Hospital			
Location: 150 Truax Avenue Trenton, Michigan			
Telephone Number: (734) 676-4200 (general info.)			
Directions to Hospital		Travel south on West Jefferson approximately 0.3 miles to Truax Avenue. Turn right (east) on Truax and travel approximately .03. The hospital is located on the left side (north) of Truax.	
(See Figure 2 - Next Page)			

APPENDIX C

HEAT STRESS

Effects of Heat Stress

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, movement) to fatal. Standard reference books should be consulted for specific treatment.

Heat-Related Problems

Heat Rash. Heat rash is caused by continuous exposure to heat and humid air and is aggravated by chafing clothes. It decreases ability to tolerate heat as well as being a nuisance.

Heat Cramps. Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps may also result from drinking iced water or other drinks either too quickly or in too large a quantity. The symptoms of heat cramps are as follows:

- Muscle cramps in legs and abdomen
- Pain accompanying cramps
- Faintness
- Profuse perspiration

To provide emergency care for heat cramps, remove the patient to a cool place. Give him/her sips of liquids such as Gatorade or its equivalent. Apply manual pressure to the cramped muscle. Remove the patient to a hospital if there is any indication of a more serious problem.

Heat Exhaustion. Heat exhaustion occurs in individuals working in hot environments; this disorder may be associated with heat cramps. It is brought about by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to

the surface by the blood. The skin vessels become dilated, and a large amount of blood is pooled in the skin. This condition, plus the blood pooled in the lower extremities when in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse. The symptoms of heat exhaustion are as follows:

- Weak pulse
- Rapid and usually shallow breathing
- Generalized weakness
- Pale, clammy skin
- Profuse perspiration
- Dizziness
- Unconsciousness
- Appearance of having fainted (the patient responds to the same treatment administered in cases of fainting)

To provide emergency care of heat exhaustion, remove the patient to a cool place and remove as much clothing as possible. Administer cool water, Gatorade or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock and remove him to a medical facility if there is any indication of a more serious problem.

Heat Stroke. Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with high fever and collapse. Sometimes this condition results in convulsions, unconsciousness and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a 20 percent mortality rate. Alcoholics are extremely susceptible. The symptoms of heat stroke are as follows:

- Sudden onset
- Dry, hot and flushed skin
- Dilated pupils

- Early loss of consciousness
- Full and fast pulse
- Breathing deep at first, later shallow and even almost absent
- Muscle twitching, growing into convulsions
- Body temperature reaching 105 to 106 degrees or higher

When providing emergency care for heat stroke, remember that this is a true emergency. Transportation to a medical facility should not be delayed. Remove the patient to a cool environment if possible and remove as much clothing as possible. Assure an open airway. Reduce body temperature promptly by dousing the body with water or preferably by wrapping in a wet sheet. If cold packs are available, place them under the arms, around the neck, at the ankles, or any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions, especially from tongue biting.

Heat Stress Monitoring

All supervisors should ensure that their personnel are briefed on the hazards, symptoms and treatment of heat related problems.

For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing impervious clothing should commence when the ambient temperature is 70°F or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 85°F, workers should be monitored for heat stress after every work period.

1. Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The heart rate at the beginning of the rest period should not exceed 110 beats per minute. If the heart rate is higher, the next work period should be shortened by ten minutes (or 33 percent), while the length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.
2. Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99°F. If it does, the next work period should be shortened by ten

minutes (or 33 percent), while the length of the rest period stays the same. However, if the oral temperature exceeds 99.7°F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. Oral temperature should be measured again at the end of the rest period to make sure that it has dropped below 99°F.

3. Body water loss (BWL) due to sweating should be measured by weighing the worker in the morning and in the evening. The clothing worn should be similar at both weighings; preferably the workers should be nude. The scale should be accurate to plus or minus 1/4 pound. Body water loss should not exceed 1.5 percent of the total body weight. If it does, the worker should be instructed to increase his daily intake of fluids by the weight lost. Ideally, body fluids should be maintained at a constant level during the work day. This requires replacement of salt lost in sweat as well.
4. Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

PERSONNEL MONITORING

Heat Stress

The Site Safety Officer or Site Supervisor will administer the following heat stress monitoring schedule required for those individuals performing continuous work under the conditions listed below. The individual performing the monitoring will be familiar with the symptoms and first aid procedures for heat stress listed in this Attachment employees will be encourage to monitor signs of heat stress among fellow employees via the "buddy system" when working in Levels B or C in temperatures above 85°F. The Site Safety Officer, Site Supervisor or On-Site Coordinator should be contacted immediately upon the notice of any signs of heat stress in fellow employees. Fluids will be made available to all workers during work breaks. **Individuals working in Level A will be monitored for heat stress during every work break and immediately upon personal protective equipment removal.**

Monitoring Frequency

<u>Temperature (degree F)</u>	<u>LEVEL D</u>	<u>LEVEL C OR B</u>
> 90	Every 45 minutes	Every 20 minutes
85-90	Every 60 minutes	Every 30 minutes
80-85	Every 90 minutes	Every 60 minutes
75-80	Every 120 minutes	Every 90 minutes

Signs and Symptoms of Heat Stress

Heat Cramps: Caused by heavy sweating without electrolyte replacement. Signs and symptoms include: muscle spasms, pain in the hands, feet and abdomen.

Heat Exhaustion: Caused by increased cardiovascular stress or dehydration. Signs and symptoms include: pale, cool, moist skin; heavy sweating, dizziness, nausea, vomiting.

Heat Stroke: Failure of temperature regulation in the body; most serious form of heat stress; competent medical help required. Signs and symptoms include: red, hot, dry skin; reduced perspiration; nausea, dizziness or confusion; strong, rapid pulse; coma.

HYPOTHERMIA AND FROSTBITE

Symptoms

When exposed to cold temperature and/or cold water, the body reacts instinctively in a pattern designed to preserve itself. It results to involuntary reactions originating in the brain. When the brain recognizes any dangerous temperature drop in the body core, it signals the body to make adjustments to compensate for the imbalance. First, in an attempt to preserve normal temperatures in the vital internal organs, the blood vessels in the extremities constrict (vasoconstriction). This slows the blood flow to the arms and legs, preserving that energy and warm blood for the body core. If there is continued heat loss and if the body core temperature drops below 95°F (35°C), the body then tries to generate more heat through shivering, which causes metabolic heat production to increase to several times the normal rate. This is the first real warning sign of hypothermia. Further heat loss, accompanied by a body core temperature drop to 90°F (32.2°C) or below, results in speech difficulty, loss of manual dexterity, slow reactions, mental confusion, and muscle rigidity (muscle hypertonus). If exposure continues further until the body's resources are exhausted and if the cold blood reaches the heart and the brain, heart failure and coma will result and lead inevitably to death. Death occurs when the body core temperature falls below 78°F (25.6°C).

If exposure occurs in temperatures which are below freezing (30°F or below), frostbite or trench foot (immersion foot) may accompany or complicate the symptoms of hypothermia. Frostbite is the freezing of living tissues with a resultant breakdown of cell structure. Injury due to frostbite may range from superficial redness of the skin, slight numbness and blisters, to the obstruction of blood flow (ischemia), blood clots (thrombosis), or skin discoloration due to insufficient oxygen in the blood (cyanosis). Frostbite may occur if the skin comes into contact with objects whose surface temperature is below freezing, such as metal tool handles. Trench foot is caused by continuous exposure to cold, combined with persistent dampness or immersion in water. Injuries in this case include permanent tissue damage due to oxygen deficiency, damage to capillary walls, severe pain, blistering, tissue death and ulceration. Additionally, cold exposures may either induce or intensify vascular abnormalities. These include chilblain (a swelling or sore), Raynaud's disease, acrocyanosis (blueness of hands and feet), and thromboangiitis (inflammation of the innermost walls of blood vessels with accompanying clot formation). Workers suffering from these ailments should take particular precautions to avoid chilling.

For Frostbite:

1. Wrap the victim in woolen cloth and keep dry until he or she can be brought inside.
2. Do not rub, chafe or manipulate frozen parts.
3. Bring the victim indoors.
4. Place the victim in warm water (102° to 105°F) and make sure it remains warm. Test the water by pouring it on the inner surface of your forearm. Never thaw affected parts if the victim has to go back out into the cold. The affected area may be refrozen.
5. Do not use hot water bottles or a heat lamp, and do not place the victim near a hot stove.
6. Do not allow the victim to walk if his or her feet are affected.
7. Have the victim gently exercise the affected parts once they are thawed.
8. Seek medical aid for thawing of serious frostbite because the pain will be intense and tissue damage will be extensive.